Union of Bricklayers and Allied Craftsmen. Some terrazzo workers belong to the United Brotherhood of Carpenters and Joiners of the United States. According to the limited information available, average hourly earnings—including benefits—for cement masons who belonged to a union and worked full time, ranged between $15.40 and $46.80 in 1998. Cement masons in New York, Boston, San Francisco, Chicago, Los Angeles, Philadelphia, and other large cities received the highest wages. Nonunion workers generally have lower wage rates than union workers. Apprentices usually start at 50 to 60 percent of the rate paid to experienced workers.

**Related Occupations**
Cement masons, concrete finishers, and terrazzo workers combine skill with knowledge of building materials to construct buildings, highways, and other structures. Other occupations involving similar skills and knowledge include bricklayers, form builders, marble setters, plasterers, stonemasons, and tilesetters.

**Sources of Additional Information**
For information about apprenticeships and work opportunities, contact local concrete or terrazzo contractors; locals of unions previously mentioned; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or State apprenticeship agency.

For general information about cement masons, concrete finishers, and terrazzo workers, contact:

- Associated General Contractors of America, Inc., 1957 E St. NW., Washington, DC 20006.
- International Union of Bricklayers and Allied Craftsmen, International Masonry Institute Apprenticeship and Training, 815 15th St. NW., Suite 1001, Washington, DC 20005.
- Operative Plasterers' and Cement Masons' International Association of the United States and Canada, 14405 Laurel Place, Suite 300, Laurel, MD 20707.
- National Terrazzo and Mosaic Association, 101 E. Market St., Suite 2004, Leesburg, VA 20176-3122.
- Portland Cement Association, 5420 Old Orchard Rd., Skokie, IL 60077.
- United Brotherhood of Carpenters and Joiners of America, 101 Constitution Ave. NW., Washington, DC 20001.

# Construction Equipment Operators

(O*NET 87708, 97938, and 97956)

**Significant Points**

- Most acquire their skills on the job, but some construction equipment operators complete formal apprenticeship programs.
- Employment is expected to grow slowly due to slow overall growth in the construction industries.
- Workers in these occupations often have high pay rates, but many cannot work in inclement weather, thus reducing earnings.

**Nature of the Work**
Construction equipment operators use machinery to move construction materials, earth, and other heavy materials and to apply asphalt and concrete to roads and other substructures. Operators control equipment by moving levers or foot pedals, operating switches, or turning dials. The operation of much of this equipment is becoming more complex as a result of computerized controls. Construction equipment operators may also set up and inspect equipment, make adjustments, and perform minor repairs.

Construction equipment operators include grader, bulldozer, and scraper operators, operating engineers, and paving, surfacing, and tamping equipment operators. *Grader, bulldozer, and scraper operators* gouge out, distribute, level, and grade earth with vehicles equipped with a concave blade attached across the front. In addition to the familiar bulldozers, they operate trench excavators, road graders, and similar equipment. Operators maneuver the equipment in successive passes to raise or lower terrain to a specific grade. They may uproot trees and move large rocks while preparing the surface.

*Operating engineers* are unique in that they operate several different types of power construction equipment such as cranes, derricks, shovels, tractors, scrapers, pumps and hoists. They may operate cranes and derricks that lift materials, machinery, or other heavy objects from the ground. They extend or retract a horizontally mounted boom to lower, or raise a hook attached to the loadline, often in response to hand signals and radioed instructions from other workers. They also may operate excavation and loading machines equipped with scoops, shovels, or buckets that dig sand, gravel, earth, or similar materials and load it into trucks or onto conveyors. Sometimes they may drive and control industrial trucks or tractors equipped with a forklift or boom for lifting materials or hitches for pulling trailers. They also may operate and maintain air compressors, pumps, and other power equipment at construction work sites.

*Paving and surfacing equipment operators* use levers and other controls to operate machines that spread and level asphalt or spread and smooth concrete for roadways or other substructures. *Asphalt paving machine operators* turn valves to regulate the temperature and flow of asphalt onto the roadbed. They must watch that the machine distributes the paving material evenly and without voids and make sure there is a constant flow of asphalt going into the hopper. *Concrete paving machine operators* move levers and turn handwheels to lower an attachment that spreads, vibrates, and levels wet concrete within forms. They must observe the surface of concrete to point out low spots for workers to add concrete. They use other attachments to the machine to float the surface of the concrete, spray on a curing compound, and cut expansion joints. *Tamping equipment operators* operate tamping machines that compact earth and other fill materials for roadbeds. They also may operate machines with interchangeable hammers to cut or break up old pavement and drive guardrail posts into earth.

**Working Conditions**
Many construction equipment operators work outdoors, in nearly every type of climate and weather condition. Some machines, including bulldozers, scrapers, and particularly tampers, are noisy and shake or jolt the operator. As with most machinery, accidents generally can be avoided by observing proper operating procedures and safety practices.


*Many construction equipment operators work outdoors in hot and cold weather and sometimes in rain or snow.*

Some operators work in remote locations on large construction projects, such as highways and dams, or in factory or mining operations.

**Employment**

Construction equipment operators held about 321,000 jobs in 1998. Jobs were distributed as follows:

| | |
|---|---|
| Operating engineers | 126,000 |
| Grader, bulldozer, and scraper operators | 122,000 |
| Paving, surfacing, and tamping equipment operators | 74,000 |

About 3 out of every 5 construction equipment operators worked in the construction industry. Many equipment operators worked in heavy construction building structures such as bridges or railroads, and substructures such as highways and streets. About one-fourth of all construction equipment operators worked in State and local government. Others, mostly grader, bulldozer, and scraper operators, worked in mining. Some also worked in manufacturing and for utility companies. A few construction equipment operators were self-employed.

Construction equipment operators work in every section of the country.

**Training, other qualifications and advancement**

Construction equipment operators usually learn their skills on the job. Operators need a good sense of balance, the ability to judge distance, and good eye-hand-foot coordination. Employers of construction equipment operators generally prefer to hire high school graduates, although some employers may train persons having less education to operate some types of equipment.

The more technologically advanced construction equipment has computerized controls, which require different operating skills than in the past. Operators of such equipment may need more training and some understanding of electronics. Mechanical aptitude and high school training in automobile mechanics are helpful because workers may perform some maintenance on their machines. Experience operating related mobile equipment, such as farm tractors or heavy equipment in the Armed Forces, is an asset.

Beginning construction equipment operators handle light equipment under the guidance of an experienced operator. Later, they may operate heavier equipment such as bulldozers and cranes. Some construction equipment operators, however, train in formal 3-year operating engineer apprenticeship programs administered by union-management committees of the International Union of Operating Engineers and the Associated General Contractors of America. Because apprentices learn to operate a wider variety of machines than other beginners, they usually have better job opportunities. Apprenticeship programs consist of at least 3 years, or 6,000 hours, of on-the-job training and 144 hours a year of related classroom instruction.

Private vocational schools offer instruction in the operation of certain types of construction equipment. Completion of such a program may help a person get a job as a trainee or apprentice. However, persons considering such training should check the reputation of the school among employers in the area.

**Job Outlook**

Overall employment of construction equipment operators is expected to increase more slowly than the average for all occupations through the year 2008. About 60 percent of these workers are concentrated in the construction industry, which is projected to grow slowly over the next ten years. Although demand for most construction equipment operators should keep pace with growth of the construction industry, increased spending on improving the Nation's infrastructure of highways, bridges, and dams should result in slightly stronger demand for paving, surfacing, and tamping equipment operators. In addition to employment growth in this occupation, many jobs openings will arise because of the need to replace experienced workers who transfer to other occupations or leave the labor force.

Equipment improvements are also expected to continue to raise workers' productivity and moderate demand for skilled operators. Technological advances in hydraulics and electronics have led to better equipment that requires more skill to operate than was previously necessary. Precision computerized controls and robotics are automating many crane and tower operator and hoist and winch operator positions, slowing employment growth for operating engineers.

Employment of construction equipment operators is sensitive to fluctuations in the economy. Workers in these trades may experience periods of unemployment when the level of nonresidential construction activity falls.

**Earnings**

Earnings for construction equipment operators vary. In 1998, median hourly earnings of operating engineers were $16.95. The middle 50 percent earned between $12.72 and $22.34. The lowest 10 percent earned less than $10.32 and the highest 10 percent earned more than $31.09. Median hourly earnings in the industries employing the largest number of operating engineers in 1997 were:

| | |
|---|---|
| Highway and street construction | $20.60 |
| Heavy construction, except highway | 19.90 |
| Miscellaneous special trade contractors | 19.20 |
| Local government, except education and hospitals | 13.50 |
| State government, except education and hospitals | 11.70 |

Median hourly earnings of grader, bulldozer, and scraper operators in 1998 were $12.94. The middle 50 percent earned between $10.64 and $17.07. The lowest 10 percent earned less than $8.94 and the highest 10 percent earned more than $21.83. Median hourly earnings in the industries employing the largest number of grader, bulldozer, and scraper operators in 1997 were:

| | |
|---|---|
| Bituminous coal and lignite mining | $17.00 |
| Highway and street construction | 12.70 |
| Miscellaneous special trade contractors | 12.50 |
| Heavy construction, except highway | 12.00 |

Median hourly earnings of paving, surfacing, and tamping equipment operators in 1998 were $11.78. The middle 50 percent earned between $9.55 and $15.81. The lowest 10 percent earned less than $7.59 and the highest 10 percent earned more than $19.91. Median hourly earnings in the industries employing the largest number of paving, surfacing, and tamping equipment operators in 1997 were:

| | |
|---|---|
| Highway and street construction | $12.00 |
| Local government, except education and hospitals | 11.30 |
| Concrete work | 11.10 |

Pay scales generally are higher in metropolitan areas. Annual earnings of some workers may be lower than hourly rates would indicate, because the amount of time they work may be limited by bad weather.

**Related Occupations**

Other workers who operate heavy mechanical equipment include truck and bus drivers, manufacturing equipment operators, logging equipment operators, and farmers and farm workers.

**Sources of Additional Information**

For further information about apprenticeships or work opportunities for construction equipment operators, contact a local of the International Union of Operating Engineers; a local apprenticeship committee; or the nearest office of the State apprenticeship agency. In addition, the local office of the State employment service may provide information about apprenticeship and other training programs.

For general information about the work of construction equipment operators, contact:

☛ National Center for Construction Education and Research, University of Florida, P.O. Box 141104, Gainesville, FL 32614-1104.

☛ Associated General Contractors of America, Inc., 1957 E St. NW., Washington, DC 20006.
☛ International Union of Operating Engineers, 1125 17th St. NW., Washington, DC 20036.

## Drywall Installers and Finishers

(O*NET 87108, 87111, and 87114)

### Significant Points

- Employment is projected to grow slowly, but thousands of job openings will arise annually because turnover is high.
- Inclement weather seldom interrupts work, but workers may be idled when downturns in the economy slow new construction activity.
- Most drywall installers and finishers learn the trade on the job, either by working as helpers or through a formal apprenticeship.

**Nature of the Work**

Drywall consists of a thin layer of gypsum between two layers of heavy paper. It is used today for walls and ceilings in most buildings because it is both faster and cheaper to install than plaster.

There are two kinds of drywall workers: installers and finishers. *Installers*, also called *applicators*, fasten drywall panels to the inside framework of residential houses and other buildings. *Finishers*, or *tapers*, prepare these panels for painting by taping and finishing joints and imperfections.

Because drywall panels are manufactured in standard sizes—usually 4 feet by 8 or 12 feet—installers must measure, cut, and fit some pieces around doors and windows. They also saw or cut holes in panels for electrical outlets, air-conditioning units, and plumbing. After making these alterations, installers may glue, nail, or screw the wallboard panels to the wood or metal framework. Because drywall is heavy and cumbersome, a helper generally assists the installer in positioning and securing the panel. A lift is often used when placing ceiling panels.

After the drywall is installed, finishers fill joints between panels with a joint compound. Using the wide, flat tip of a special trowel, they spread the joint compound into and along each side of the joint with brushlike strokes. They immediately use the trowel to press a paper tape—used to reinforce the drywall and to hide imperfections—into the wet compound and to smooth away excess material. Nail and screw depressions also are covered with this compound, as are imperfections caused by the installation of air-conditioning vents and other fixtures. On large commercial projects, finishers may use automatic taping tools that apply the joint compound and tape in one step. Finishers apply second and third coats, sanding the treated areas after each coat to make them as smooth as the rest of the wall surface. This results in a very smooth and almost perfect surface. Some finishers apply textured surfaces to walls and ceilings with trowels, brushes, or spray guns.

*Drywall installers must measure, cut, and fit some drywall pieces around doors and windows.*

**Working Conditions**

As in many other construction trades, drywall work sometimes is strenuous. Installers and finishers spend most of the day on their feet, either standing, bending, or kneeling. Some finishers use stilts to tape and finish ceiling and angle joints. Installers have to lift and maneuver heavy panels. Hazards include falls from ladders and scaffolds, and injuries from power tools. Because sanding joint compound to a smooth finish creates a great deal of dust, some finishers wear masks for protection.

**Employment**

Drywall installers and finishers held about 163,000 jobs in 1998. Most worked for contractors specializing in drywall installation; others worked for contractors doing many kinds of construction. Nearly 42,000 were self-employed independent contractors.

Most installers and finishers are employed in populated areas. In other areas, where there may not be enough work to keep a drywall installer employed full time, carpenters and painters usually do the drywall work.

**Training, Other Qualifications, and Advancement**

Most drywall workers start as helpers and learn their skills on the job. Installer helpers start by carrying materials, lifting and holding panels, and cleaning up debris. Within a few weeks, they learn to measure, cut, and install materials. Eventually, they become fully experienced workers. Finisher apprentices begin by taping joints and touching up nail holes, scrapes, and other imperfections. They soon learn to install corner guards and to conceal openings around pipes. At the end of their training, drywall installers and finishers learn to estimate the cost of installing and finishing drywall.

Some drywall installers and finishers learn their trade in an apprenticeship program. The United Brotherhood of Carpenters and Joiners of America, in cooperation with local contractors, administers an apprenticeship program in carpentry that includes instruction in drywall installation. In addition, local affiliates of the Associated Builders and Contractors and the National Association of Home Builders conduct training programs for nonunion workers. The International Brotherhood of Painters and Allied Trades conducts a 2-year apprenticeship program for drywall finishers.

Employers prefer high school graduates who are in good physical condition, but they frequently hire applicants with less education. High school or vocational school courses in carpentry provide a helpful background for drywall work. Regardless of educational background, installers must be good at simple arithmetic.

Drywall workers with a few years' experience and leadership ability may become supervisors. Some workers start their own contracting businesses.

**Job Outlook**

Replacement needs will account for almost all job openings for drywall installers and finishers through the year 2008. Thousands of jobs will open up each year because of the need to replace workers who transfer to jobs in other occupations or leave the labor force. Turnover in this occupation is very high, reflecting the lack of formal training requirements and the fluctuations of the business cycle, to which the construction industry is very sensitive. Because of their relatively weak